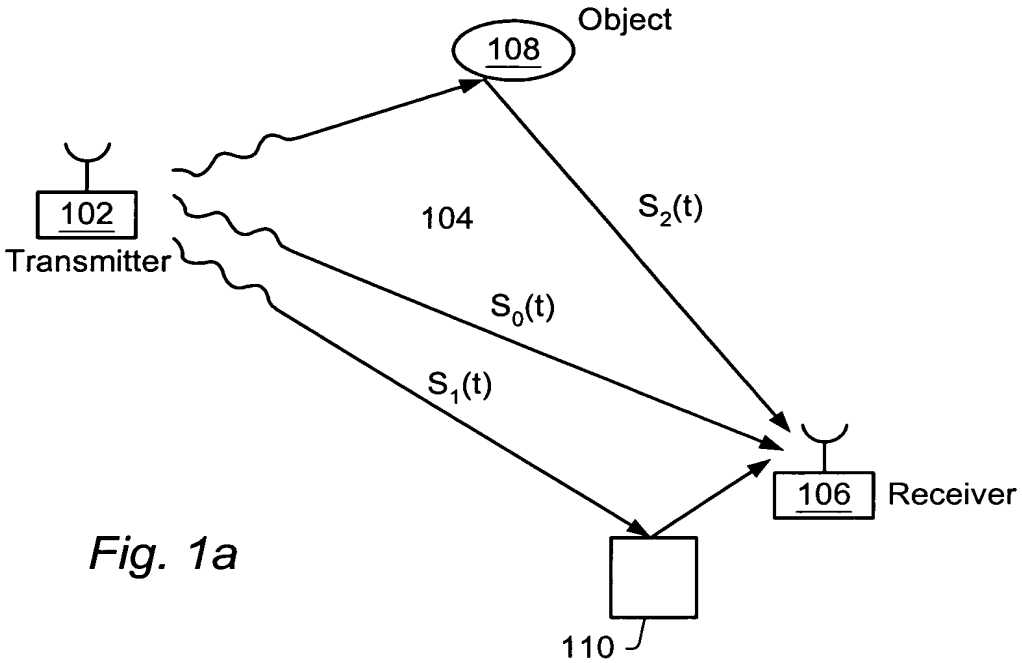

Object
108
102
Transmitter
104
$S_2(t)$
$S_0(t)$
$S_1(t)$
106
Receiver
110

Fig. 1a

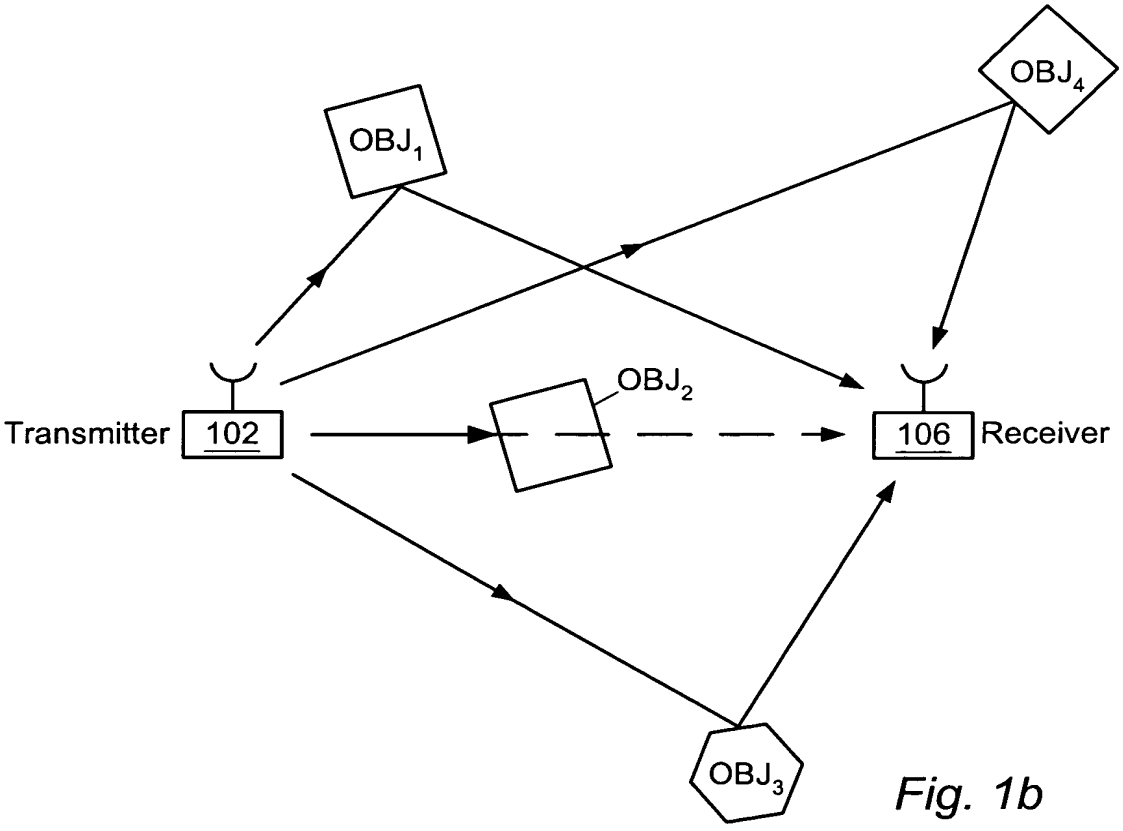

OBJ_4
OBJ_1
OBJ_2
Transmitter
102
106
Receiver
OBJ_3

Fig. 1b

Block diagram of HDTV channel and receiver signal processing chain.

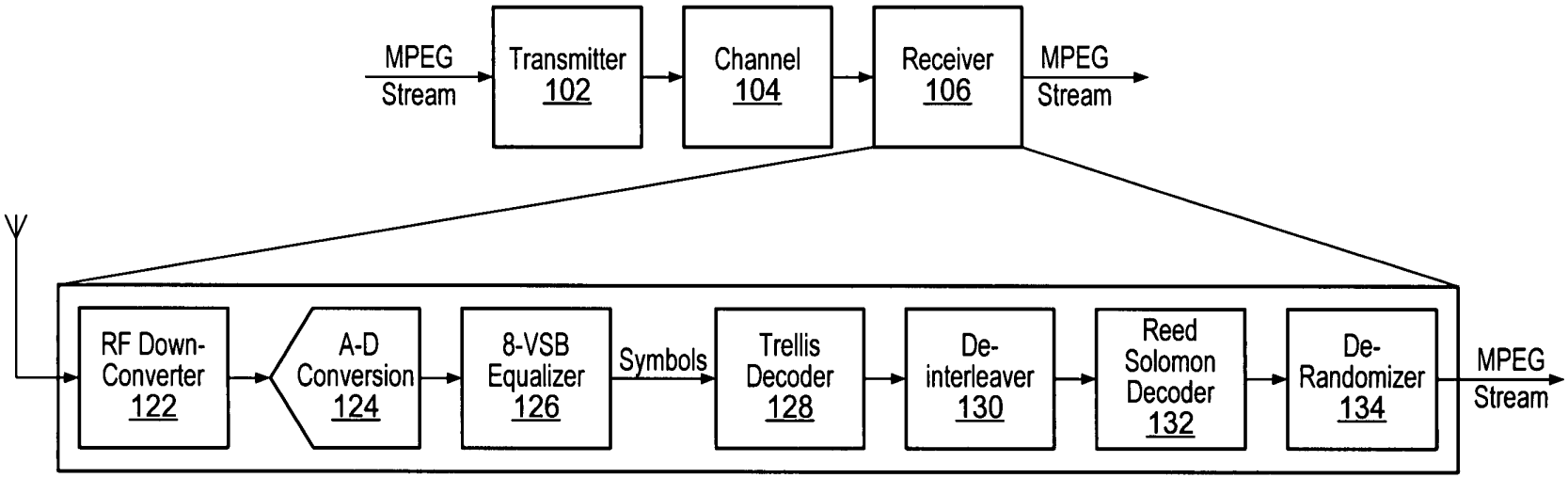


Fig. 2

Overview of frequency Domain Equalization Algorithm

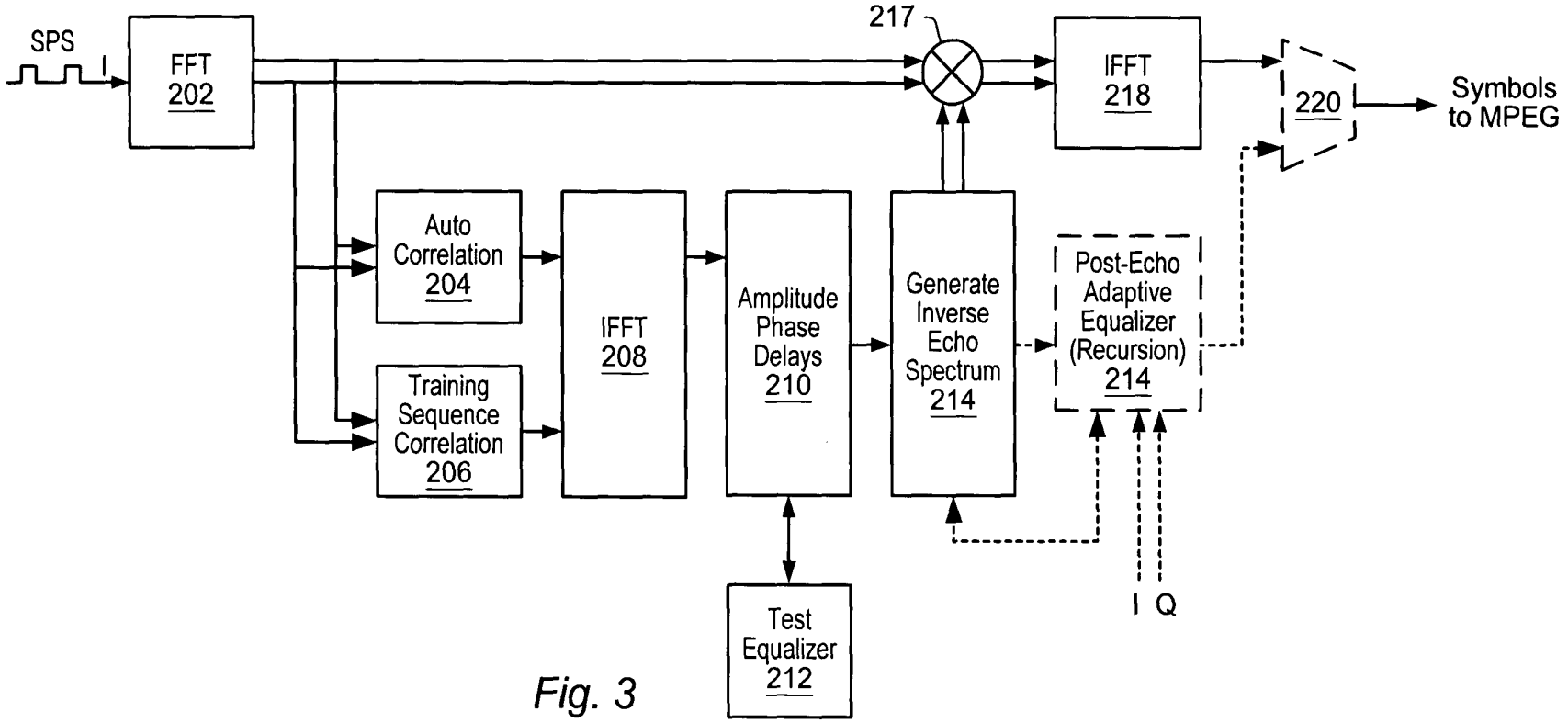


Fig. 3

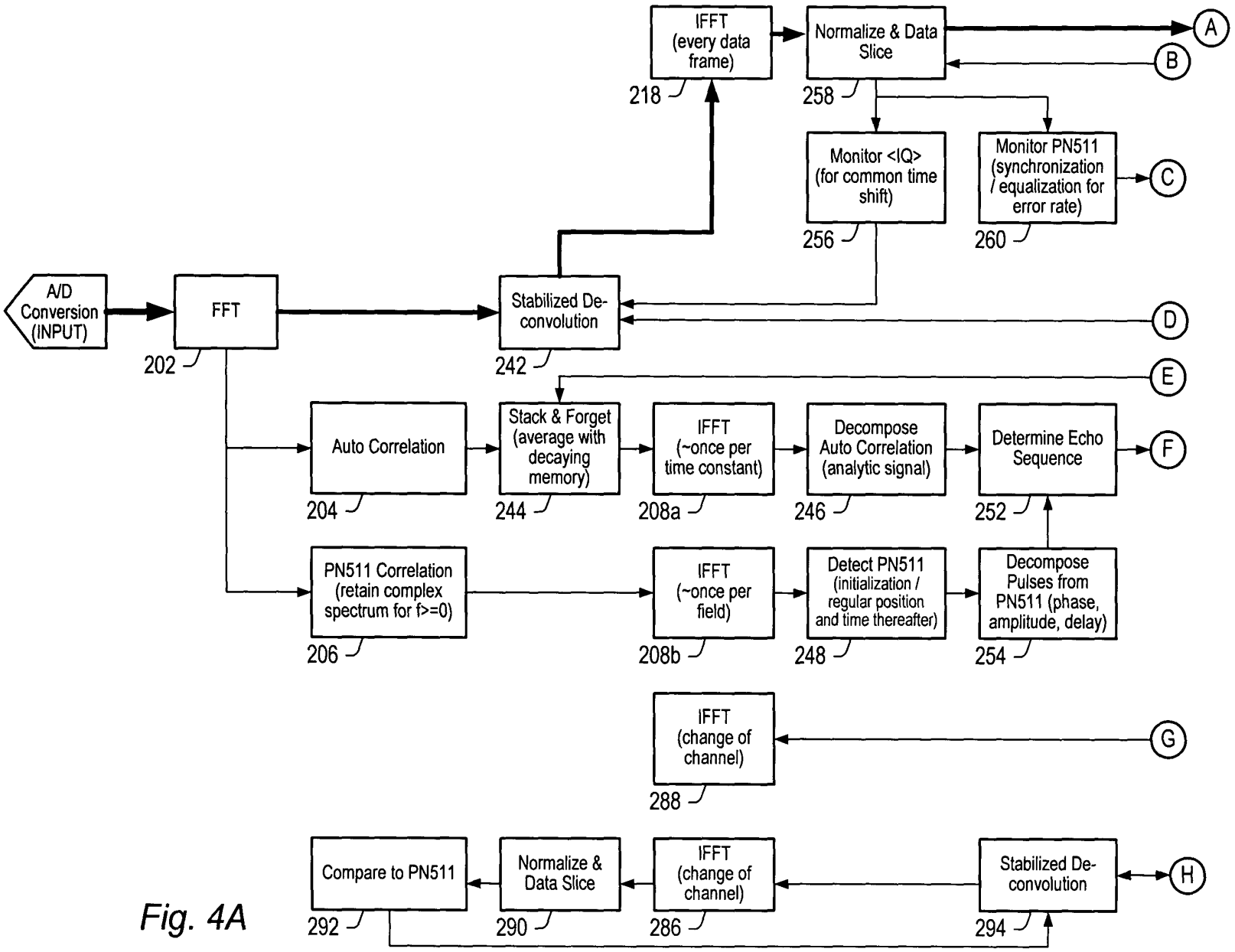

A/D Conversion (INPUT)
FFT
202
Stabilized De-convolution
242
IFFT (every data frame)
218
Normalize & Data Slice
258
A
B
Monitor <IQ> (for common time shift)
256
Monitor PN511 (synchronization / equalization for error rate)
260
C
D
E
Auto Correlation
204
Stack & Forget (average with decaying memory)
244
IFFT (~once per time constant)
208a
Decompose Auto Correlation (analytic signal)
246
Determine Echo Sequence
252
F
PN511 Correlation (retain complex spectrum for f>=0)
206
IFFT (~once per field)
208b
Detect PN511 (initialization / regular position and time thereafter)
248
Decompose Pulses from PN511 (phase, amplitude, delay)
254
IFFT (change of channel)
288
G
Compare to PN511
292
Normalize & Data Slice
290
IFFT (change of channel)
286
Stabilized De-convolution
294
H

Fig. 4A

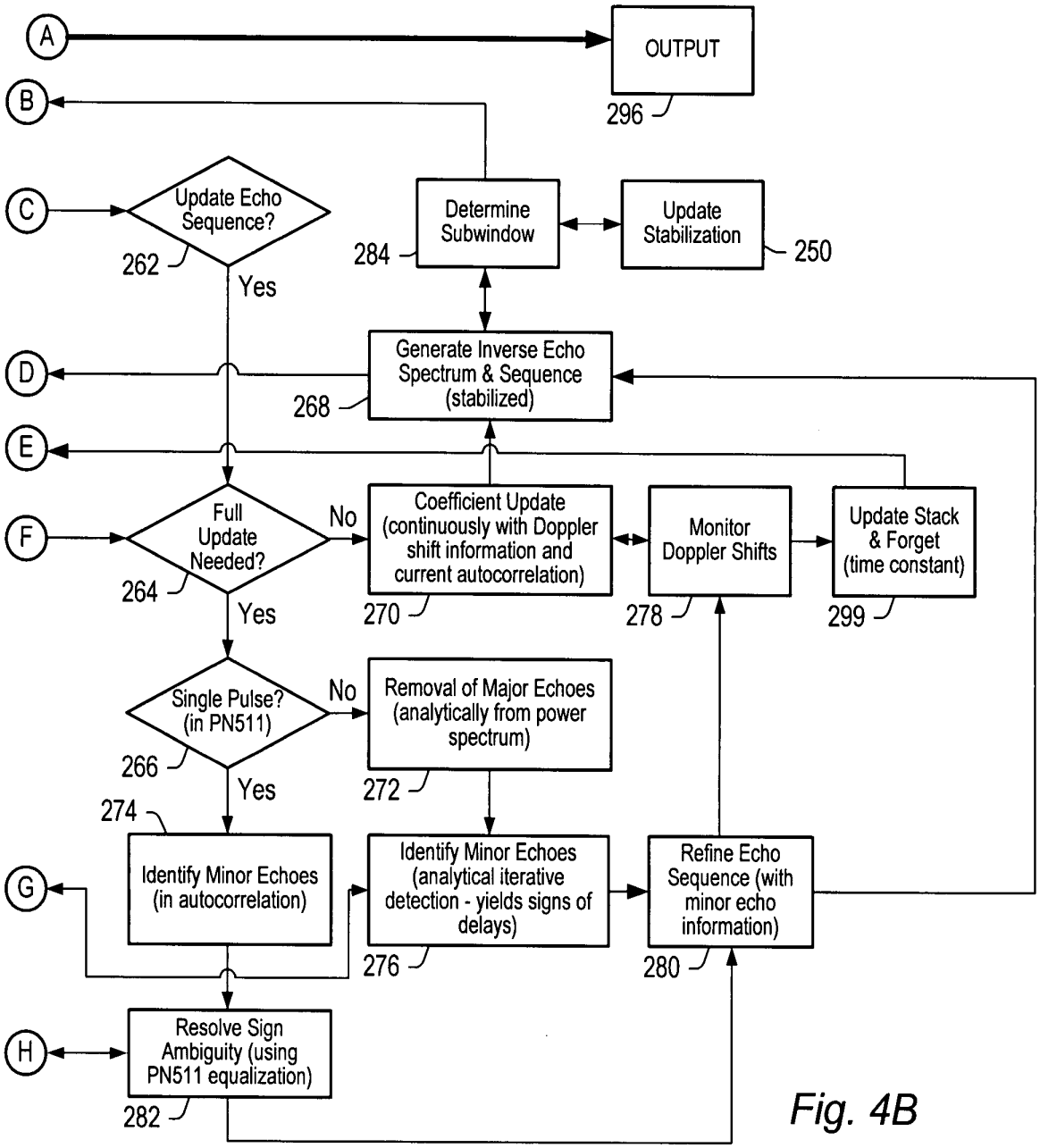
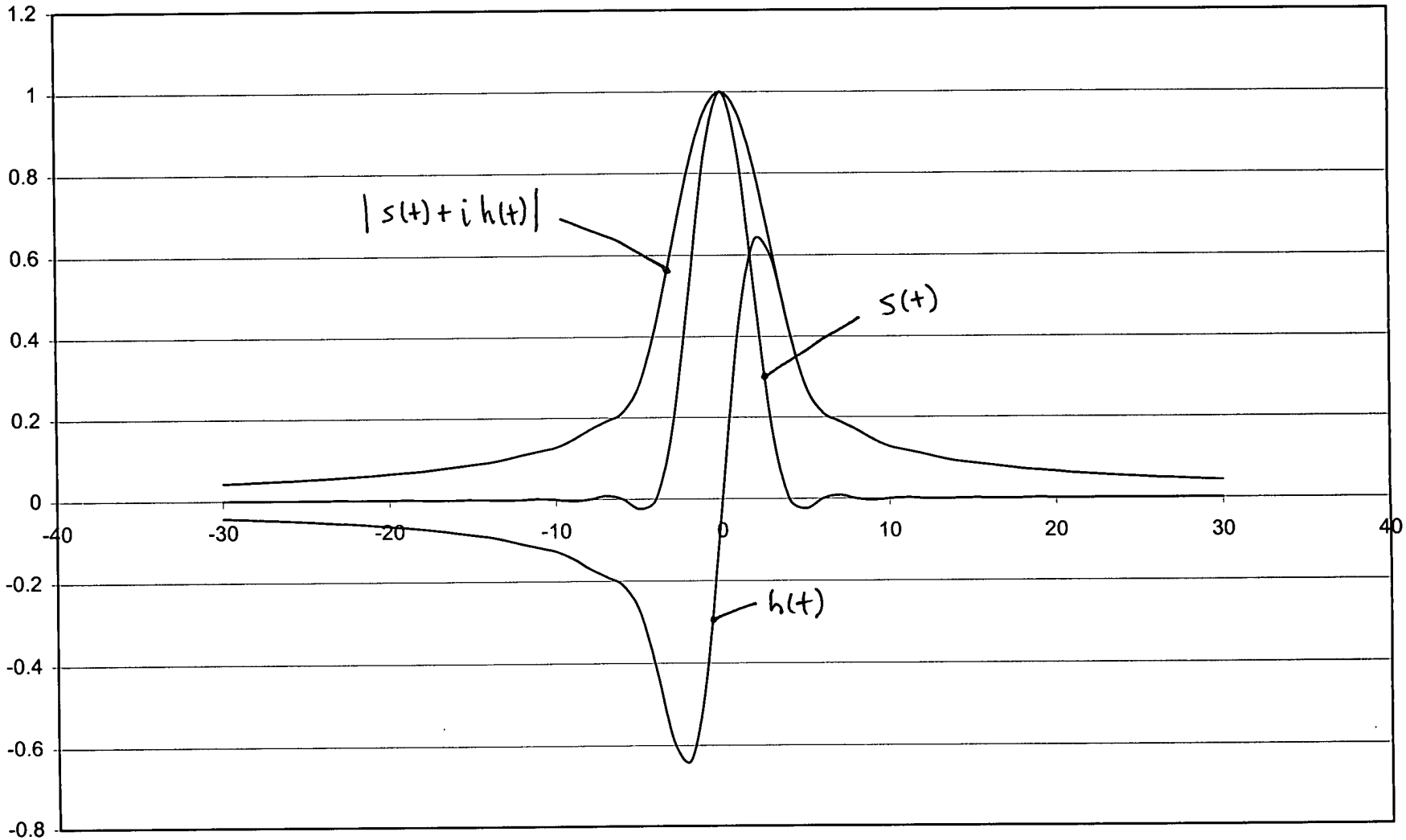

A
OUTPUT
296
B
C
Update Echo Sequence?
262
Yes
Determine Subwindow
284
Update Stabilization
250
D
Generate Inverse Echo Spectrum & Sequence (stabilized)
268
E
F
Full Update Needed?
264
No
Coefficient Update (continuously with Doppler shift information and current autocorrelation)
270
Monitor Doppler Shifts
278
Update Stack & Forget (time constant)
299
Yes
Single Pulse? (in PN511)
266
No
Removal of Major Echoes (analytically from power spectrum)
272
Yes
274
G
Identify Minor Echoes (in autocorrelation)
Identify Minor Echoes (analytical iterative detection - yields signs of delays)
276
Refine Echo Sequence (with minor echo information)
280
H
Resolve Sign Ambiguity (using PN511 equalization)
282

Fig. 4B

Fig. 5



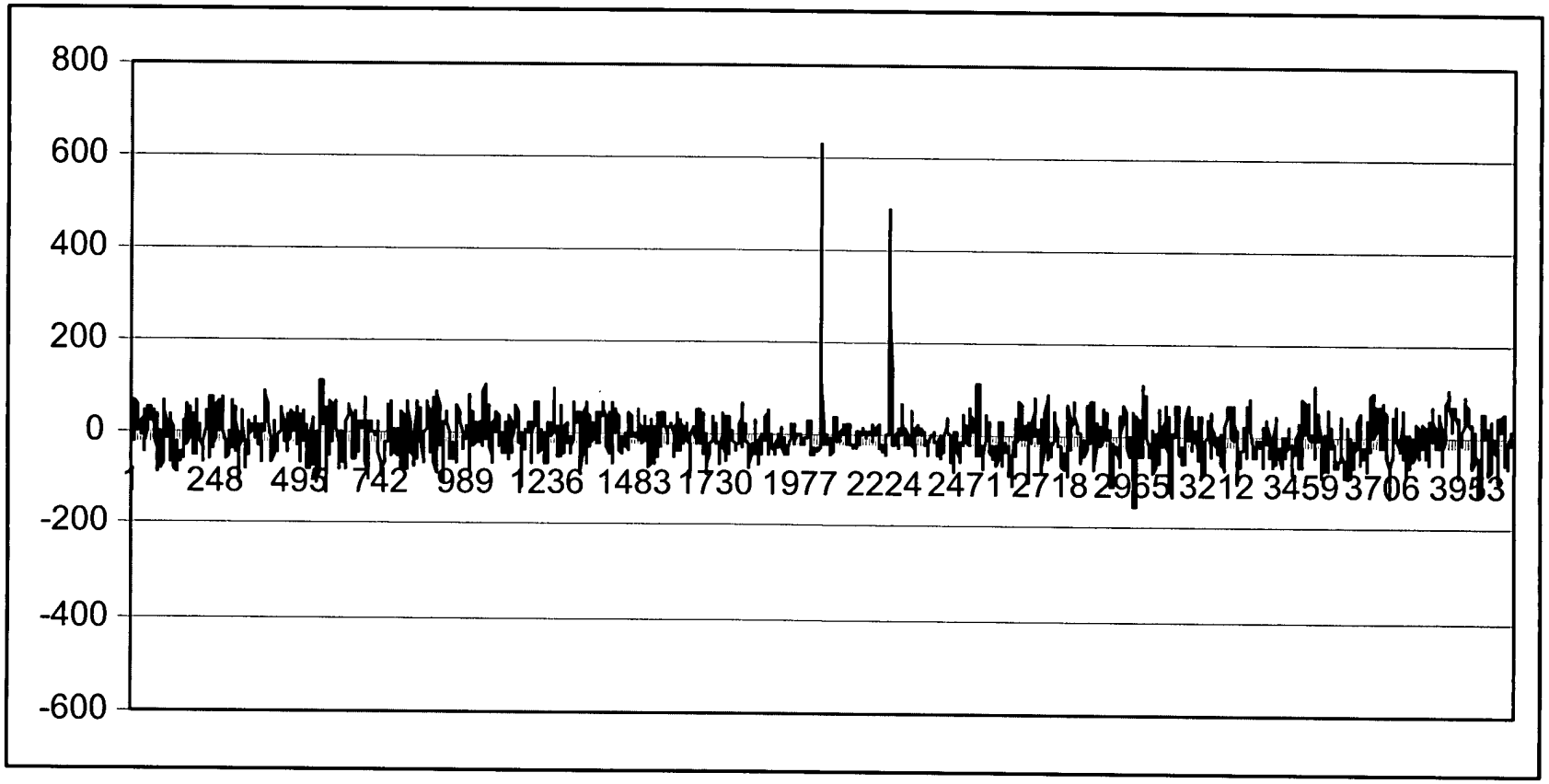

800
600
400
200
0
-200
-400
-600
1
248
495
742
989
1236
1483
1730
1977
2224
2471
2718
2965
3212
3459
3706
3953

Fig. 6A

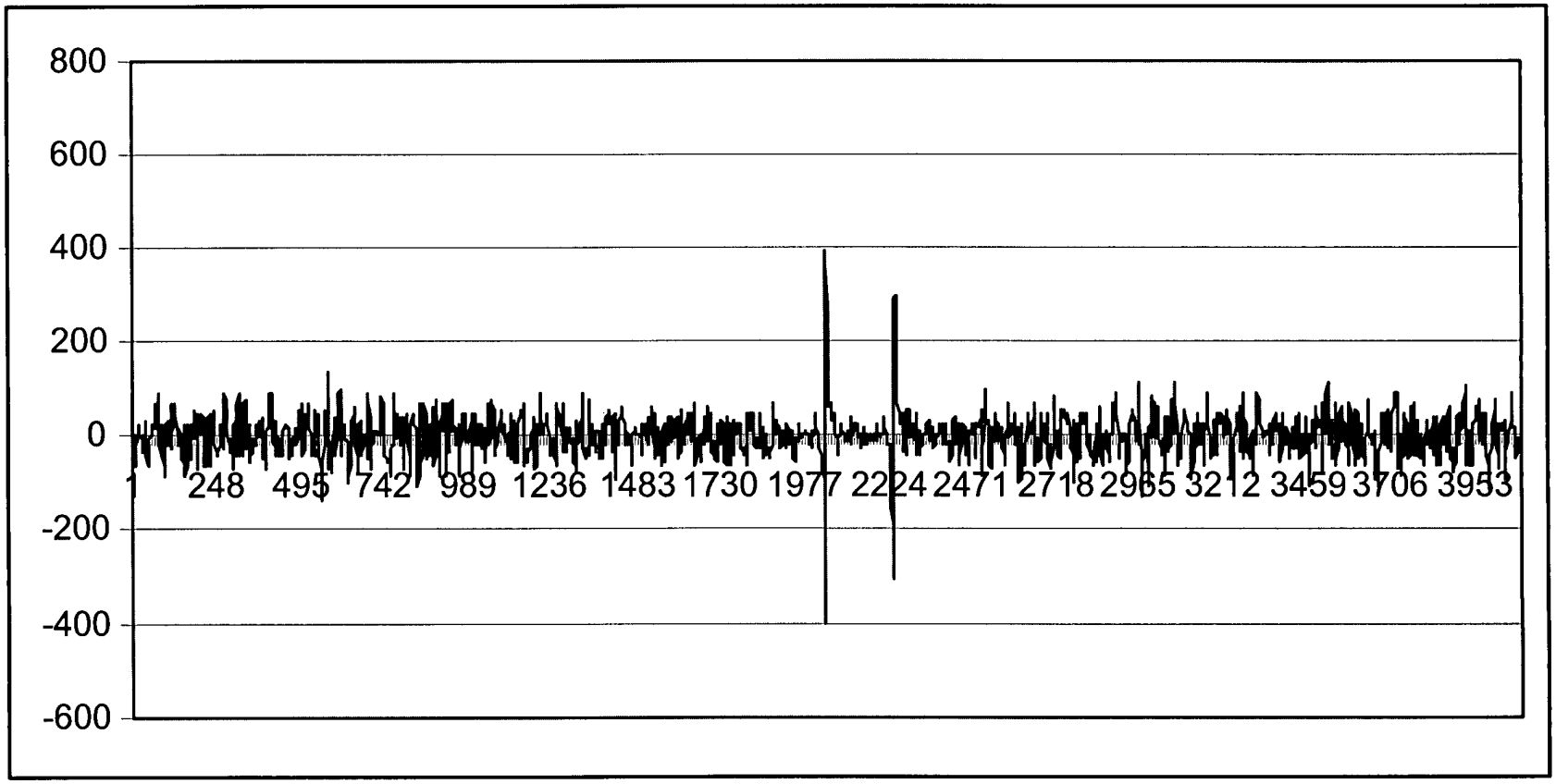

800
600
400
200
0
-200
-400
-600
1
248
495
742
989
1236
1483
1730
1977
2224
2471
2718
2965
3212
3459
3706
3953

Fig. 6B

Fig. 7

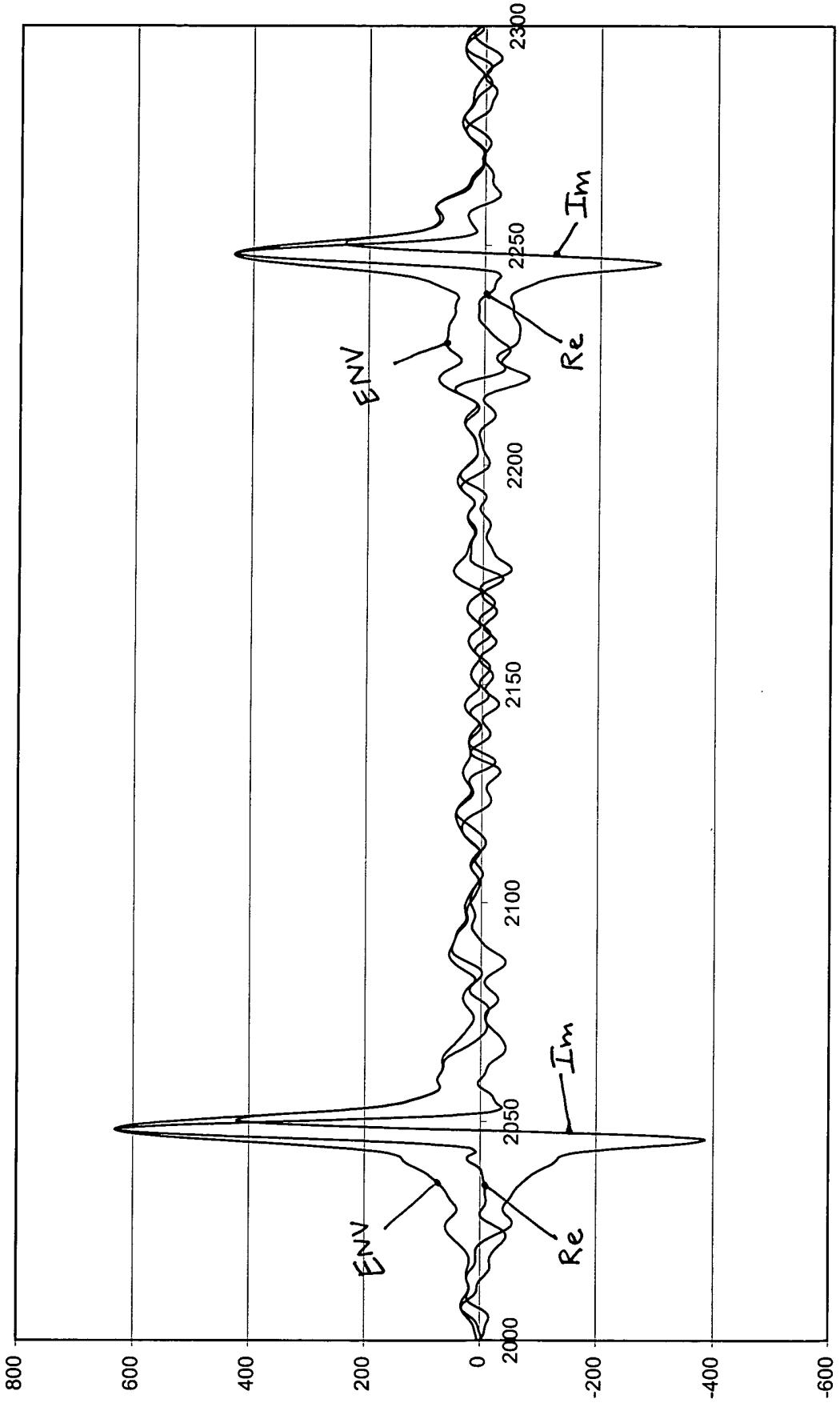
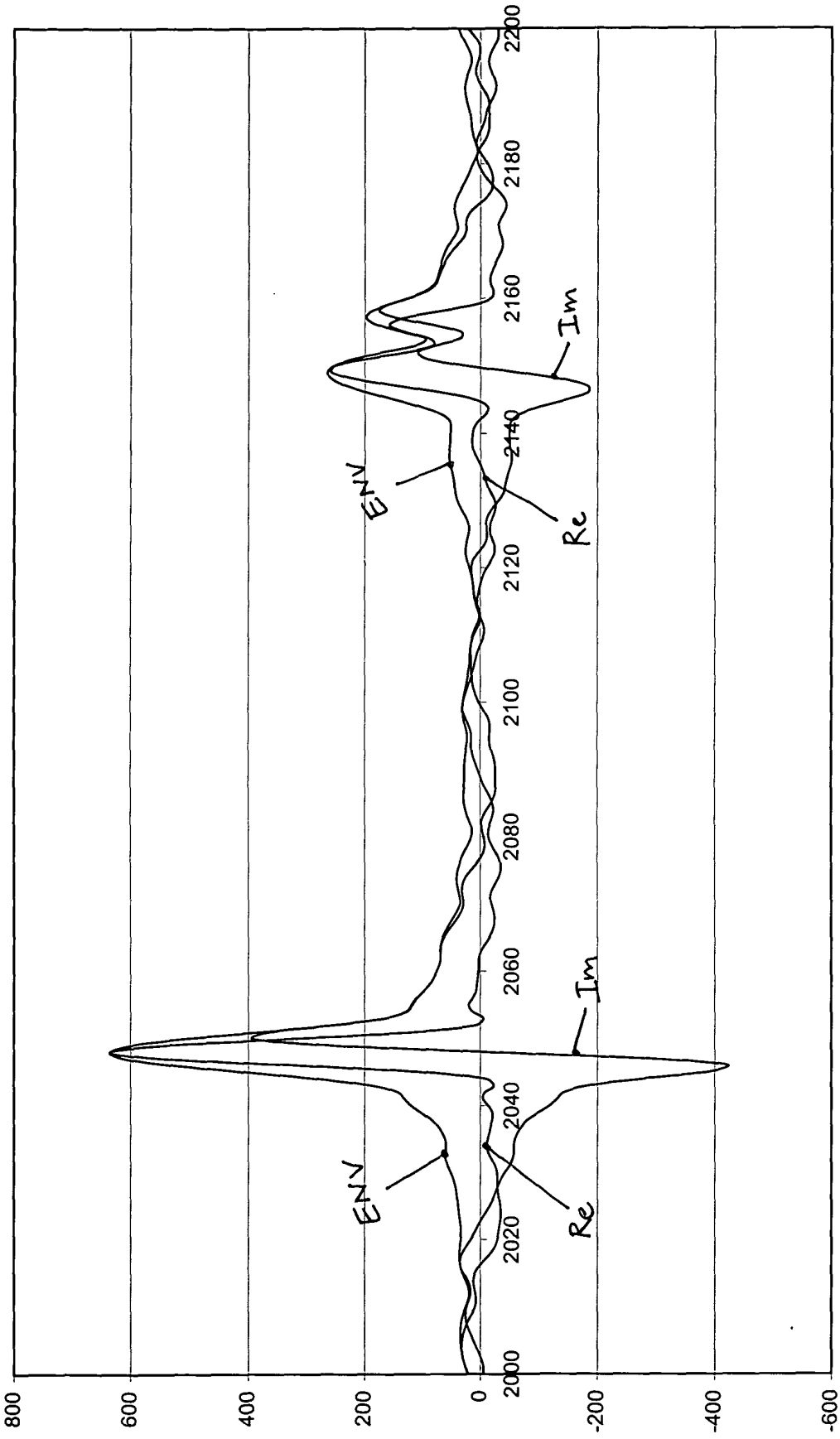

800
600
400
200
0
-200
-400
-600
2000
2050
2100
2150
2200
2250
2300
ENV
Re
Im
ENV
Re
Im

Fig. 08


800
600
400
200
0
-200
-400
-600
2000
2020
2040
2060
2080
2100
2120
2140
2160
2180
2200
ENV
Re
Im
ENV
Re
Im